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Published in:
CONTACT DERMATITIS

DOI:
[10.1111/j.1600-0536.2011.01948.x](https://doi.org/10.1111/j.1600-0536.2011.01948.x)

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2011

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Bakker, C. V., Blömeke, B., Coenraads, P. J., & Schuttelaar, M. (2011). Ascaridole, a sensitizing component of tea tree oil, patch tested at 1% and 5% in two series of patients. *CONTACT DERMATITIS*, 65(4), 240-241. <https://doi.org/10.1111/j.1600-0536.2011.01948.x>

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Ascaridole, a sensitizing component of tea tree oil, patch tested at 1% and 5% in two series of patients

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doi:10.1111/j.1600-0536.2011.01948.x

Key words: ascaridole, patch test, tea tree oil, *Melaleuca alternifolia*, contact allergy

Contact allergy to tea tree (*Melaleuca alternifolia*) oil has been reported several times, but there are very few publications on its sensitizing components. One proposed sensitizer in tea tree oil is ascaridole (1–3). Ascaridole (CAS 512-85-6) is a monoterpene that is derived from oxidized α -terpene. This is the first report of a study in which ascaridole was patch tested at 1% and 5% in two series of patients.

Case Report

From March 2008 until August 2010, 602 consecutive patients who were suspected of having allergy related to cosmetic or perfume use underwent patch tests with the European baseline series, a cosmetic and/or perfume series, and ascaridole 1% pet. From August 2010 to February 2011, we consecutively tested a similar series of 144 patients with ascaridole 5% pet. instead of 1% pet. Patch tests were applied and read according to the International Contact Dermatitis Research Group

Table 1. Patch test results of patients tested with 1% ascaridole and 5% ascaridole

| | Ascaridole 1% n (%) | Ascaridole 5% n (%) |
|-----------------|------------------------|------------------------|
| No. tested | 602 | 144 |
| + | 8 (1.3) | 19 (13.2) |
| ++ | 1 (0.16) | 2 (1.39) |
| +++ | — | — |
| Irritant | 1 (0.16) | 5 (3.5) |
| ? | 15 (2.5) | 14 (9.7) |
| + / + + / + + + | 9 (1.5) | 21 (14.6) |
| Relevant | 1 (0.16) | 2 (1.39) |

guidelines. Ascaridole was provided by the Institute of Pharmacology, University of Bonn, Germany.

In the first series, 9 (1.5%) of the 602 patients had a positive reaction to 1% ascaridole, as shown in Table 1. In 1 patient (0.16%) of the 602, the positive reaction was considered to be relevant because the patient had been using tea tree oil. There was 1 (0.16%) patient with an irritant reaction, and there were doubtful reactions in 15 (2.49%) patients. The most frequent concomitant positive patch reactions were to nickel and isoeugenol in 33% of the patients (Table 2).

In the second series, 19 (13%) of the 144 patients had a positive patch test reaction to 5% ascaridole,

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Conflicts of interest: The authors have declared no conflicts.

Table 2. Concomitant positive patch test reactions in 30 patients with positive reactions to ascaridole

| Allergen | Ascaridole 1% n = 9 (%) | Ascaridole 5% n = 21 (%) | Total n = 30 (%) |
|------------------------------|----------------------------|-----------------------------|---------------------|
| Nickel | 3 (33) | 7 (33) | 10 (33) |
| Cocamidopropyl betaine | 1 (11) | 7 (33) | 8 (27) |
| Oleamidopropyl dimethylamine | 1 (11) | 3 (14) | 4 (13) |
| Isoeugenol | 3 (33) | — | 3 (10) |
| Cobalt | 2 (22) | 1 (5) | 3 (10) |
| Colophonium | 1 (11) | 1 (5) | 2 (7) |
| Methylisothiazolinone | — | 2 (10) | 2 (7) |
| Citral | 1 (11) | 1 (5) | 2 (7) |

but its relevance could be established in only 2 cases (1.39%). One of these 2 patients used tea tree oil, and it was noted that the shaving cream used by the other patient contained tea tree oil. Interestingly, 3 patients with (non-relevant) positive reactions to 5% ascaridole in the perfume series showed no reaction in the concomitantly tested cosmetic series. In 5 (3.5%) patients there seemed to be an irritant patch test reaction, and there was a doubtful reaction in 14 (9.7%) of the patients. The most frequent concomitant positive patch test reactions in 33% of the patients were to nickel and cocamidopropyl betaine (reactions to which are often presumed to be false-positive (4)).

Discussion

To date, there are no published studies on the prevalence and relevance of patch test reactions to ascaridole. Reported proportions of positive patch test reactions to tea tree oil vary from 0.5% to 1.8% (2, 5, 6), but the sensitizing components are not mentioned.

In our two series, we tested ascaridole at two percentages, and found a relevant positive reaction to 1% ascaridole in 1 (0.16%) of the 602 tested patients, and to 5% ascaridole in 2 (1.39%) of the 144 tested patients. We noted a substantial increase in the number of positive reactions (irrespective of relevancy), besides irritant reactions, when we increased the patch test concentration to

5%. Although we may have missed potential exposure in a number of our patients who had tested positive, we feel that the proportion of reactions with unknown relevance warrants a decrease in the patch test concentration (see Fig. 1 for an example of a positive test reaction). We would like to propose a concentration of 2% ascaridole. Further studies examining the frequency of positive and relevant reactions in 1% vs. 2% ascaridole and the role of other possible potent sensitizing agents in tea tree oil are needed.



Fig. 1. Positive reaction to 5% ascaridole. The relevance in this case is unknown.

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